Strategic Reasoning

Game Theory Course:
Jackson, Leyton-Brown & Shoham

Keynes Beauty Contest Game: The Stylized Version

Keynes Beauty Contest Game: The Stylized Version

- Each player names an integer between 1 and 100.
- The player who names the integer closest to two thirds of the *average* integer wins a prize, the other players get nothing.
- Ties are broken uniformly at random.

Strategic Reasoning

- What will other players do?

Strategic Reasoning

- What will other players do?
- What should I do in response?

Strategic Reasoning

- What will other players do?
- What should I do in response?
- Each player *best responds* to the others: *Nash equilibrium*

Solving the Beauty Contest Game

- Suppose a player believes the average play will be X (including his or her own integer)

Solving the Beauty Contest Game

- Suppose a player believes the average play will be X (including his or her own integer)
- That player's optimal strategy is to say the closest integer to $\frac{2}{3}X$.

Solving the Beauty Contest Game

- Suppose a player believes the average play will be X (including his or her own integer)
- That player's optimal strategy is to say the closest integer to $\frac{2}{3}X$.
- X has to be less than 100, so the optimal strategy of any player has to be no more than 67.

Solving the Beauty Contest Game

- Suppose a player believes the average play will be X (including his or her own integer)
- That player's optimal strategy is to say the closest integer to $\frac{2}{3}X$.
- X has to be less than 100, so the optimal strategy of any player has to be no more than 67.
- If X is no more than 67, then the optimal strategy of any player has to be no more than $\frac{2}{3}67$.

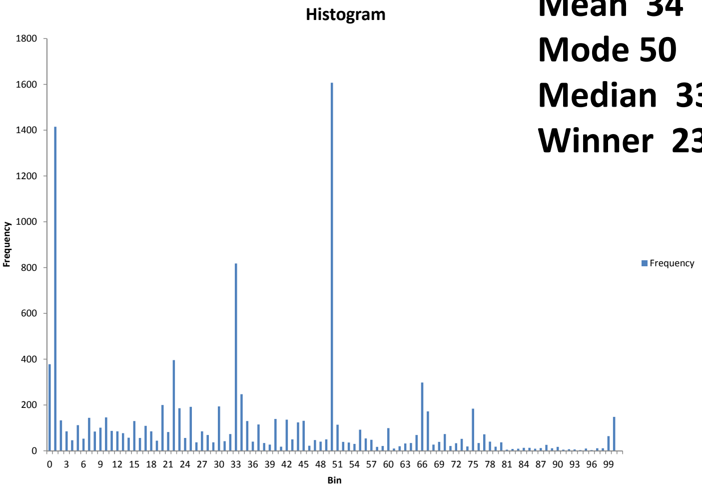
Solving the Beauty Contest Game

- Suppose a player believes the average play will be X (including his or her own integer)
- That player's optimal strategy is to say the closest integer to $\frac{2}{3}X$.
- X has to be less than 100, so the optimal strategy of any player has to be no more than 67.
- If X is no more than 67, then the optimal strategy of any player has to be no more than $\frac{2}{3}67$.
- If X is no more than $\frac{2}{3}67$, then the optimal strategy of any player has to be no more than $(\frac{2}{3})^2 67$.

Solving the Beauty Contest Game

- Suppose a player believes the average play will be X (including his or her own integer)
- That player's optimal strategy is to say the closest integer to $\frac{2}{3}X$.
- X has to be less than 100, so the optimal strategy of any player has to be no more than 67.
- If X is no more than 67, then the optimal strategy of any player has to be no more than $\frac{2}{3}67$.
- If X is no more than $\frac{2}{3}67$, then the optimal strategy of any player has to be no more than $(\frac{2}{3})^2 67$.
- Iterating, the unique Nash equilibrium of this game is for every player to announce 1!

Online course: more than 10000 players:



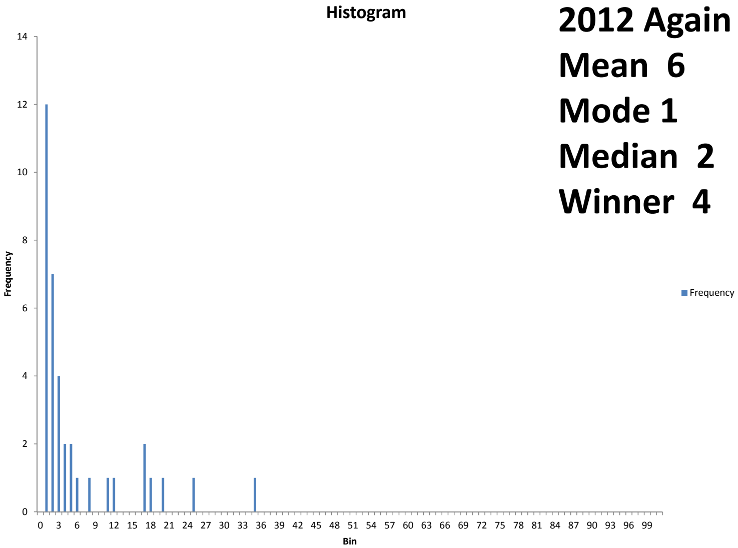
2012 GTOC

Mean 34

Mode 50

Median 33

Winner 23



2012 Again

Mean 6

Mode 1

Median 2

Winner 4

Nash Equilibrium

- A consistent list of actions:

Nash Equilibrium

- A consistent list of actions:

- Each player's action maximizes his or her payoff given the actions of the others.

Nash Equilibrium

- A consistent list of actions:

- Each player's action maximizes his or her payoff given the actions of the others.

- A self-consistent or stable profile

Summary Nash Equilibrium

- Each player's action maximizes his or her payoff given the actions of the others.

Summary Nash Equilibrium

- Each player's action maximizes his or her payoff given the actions of the others.

- Nobody has an incentive to *deviate* from their action if an equilibrium profile is played.

Summary Nash Equilibrium

- Each player's action maximizes his or her payoff given the actions of the others.

- Nobody has an incentive to *deviate* from their action if an equilibrium profile is played.

- Someone has an incentive to *deviate* from a profile of actions that do *not* form an equilibrium.

Nash Equilibrium

- Should we expect equilibria to be played?

Nash Equilibrium

- Should we expect equilibria to be played?

- Should we expect non-equilibria to be played?